

USING MANURES TO SUPPLY PLANT NUTRIENTS

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Introduction

Animal manures and compost (organic fertilizers) have been used since the earliest civilizations for improving soil properties. In years gone by, these fertilizers were the main, if not only, source of nutrients for crop and vegetable production. However, since organic fertilizers contain relatively low concentrations of nutrients, and handling them is labour-intensive, they have been largely replaced by inorganic fertilizers as nutrient sources on many farms.

Manures (and composts) have two important effects on soil properties:

- ★ they supply plant nutrients
- ★ they enrich the soil with organic matter, which improves soil physical properties (water infiltration and retention, aeration and tilth).

Their beneficial effect on soil physical properties is a major advantage that they have over inorganic fertilizers. Certainly, whenever possible, manure from animal kraals and poultry production units should be used in gardens and lands.



Valuable manure in a cattle kraal

Composition of manures

Many factors affect the concentration of nutrients in manures. Some manures are stronger fertilizers than others:

- Generally, poultry manure is highest in nutrients and cattle manure is fairly low in nutrients. The composition of manure depends very much on the quality of the feed the animal eats. The richer the feed is in proteins, the richer the manure is in nitrogen (N). Similarly, the more phosphorus (P) and potassium (K) there is in the feed, the more there is in the manure.
- Manure starts to decompose as soon as the animal deposits it. If the manure is exposed and allowed to dry out, much of the N in it may be lost to the air.
- Potassium may be lost from the manure by the leaching action of rain water.

To minimize losses of nutrients during storage, manure can be heaped. For the best use of any manure, it should not be stored for a long time, and it must be worked into the soil as soon as possible after spreading on the land.

'Typical' N, P and K concentrations in cattle and poultry manures are shown in Table 1. However, as discussed earlier, many factors affect the composition of manure, and for this reason the data in Table 1 are, at best, very rough guidelines.

Table 1 'Typical' N, P and K concentrations in cattle and poultry manures (as is basis)

Manure Type	N	P	K
	-----	%	-----
cattle	1.0	0.5	1.0
poultry	3.6	1.2	1.3

Use of manures in crop production

Not all the nutrients in manures are readily available for uptake by plant roots. Much of the N and P in manures is combined with organic substances and only becomes available to plants when these substances decay. In contrast, all of the K in manures is readily available for plant uptake.

In chicken manure, about 90% of the total N and P is available for plant uptake in the year of application. However, in cattle manure, only about 20% of the total N and 40% of the total P becomes available in the year of application (these figures are for cattle manure with a composition similar to that listed in Table 1; the availabilities of N and P increase with increasing quality of the manure).

Using the above availability figures, and the nutrient concentrations given in Table 1, we can work out how much of each nutrient will be available for plant uptake in the year of application. The quantity of nutrients available at two rates of manure application are presented in Table 2. Note that large amounts of nutrients are supplied by poultry manure, while very little N is supplied in low-quality cattle manure.

Using cattle manure, a reasonable application would be 20 t/ha, or 20 kg on an area of 10 m² (such as a patch 2 m wide and 5 m long). This is roughly equivalent to about 4 litres of manure for 1 m² (four or five maize or cabbage plants). This amount of cattle manure would supply a reasonable amount of P and a lot of K (see Table 2), but a topdressing of fertilizer N may be necessary for good yields.



Manure being used in a community garden. The manure should be evenly spread and mixed into the soil as soon as possible in order to minimize nitrogen losses to the air.

Table 2. Amounts of nutrients available for plant uptake in the year of application of manures (calculated on the basis of manures with NPK concentrations similar to those listed in Table 1)

Manure Type	Rate (t/ha)	Nutrients Supplied (kg/ha)		
		N	P	K
Cattle	5	10	10	50
	20	40	40	200
Poultry	5	162	54	65
	20	648	216	260

Chicken litter would usually be applied at a rate of about 5 t/ha. This is roughly equivalent to one litre of chicken litter for 1 m² (four or five maize or cabbage plants). This would supply a large amount of N and a substantial amount of P, but if the soil is low in K, more K should be applied as fertilizer.

A 'scoop' made out of plastic five-litre bottles or five-litre oil cans would be ideal for measuring out manures.



Harvesting a good crop of maize produced with a combination of manure and fertilizer

Further information on the use of manures may be obtained from **Neil Miles** (3559 403), **Alan Manson** (3559 464), **Vlatko Katusic** (3559 466) and **Victor Roberts** (3559 459).